THE SOUTHERN DENT CORNS

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The older maize varieties of the southern United States are of interest for two reasons: (1) Some of them were extensively used in developing the more highly derived varieties of the United States corn belt. (2) They show a strong affinity to the dent corns of central Mexico. When their history can be worked out in more detail, it should shed significant light on the relationships of the brilliant civilizations of central Mexico and the lands to the north.

In the states east of the Mississippi, maize has had, on the whole, a relatively simple history. As we have demonstrated (Brown & Anderson, 1947), the northern flints were widely distributed in pre-Columbian times in the northeastern states where they were the only type of corn grown over a considerable area. In the Gulf States and spreading northward from them, there were at least two other major types of maize: (1) the old white dents, and (2) the Caribbean flints. We do not yet have any exact knowledge of when the intermingling of these southern types began. We do know that by the early nineteenth century the old southern dents were, on the one hand, being intentionally crossed with the Caribbean flints and, on the other hand, with the northern flints. From the latter union there was eventually developed the distinctive, cylindrical dent corn of the United States corn belt.

Today in the southern states one may still find authentic samples of such old dent varieties as Gourdseed and Shoepeg. They are not easy to come by and require extensive searching among conservative families in more or less isolated neighborhoods. Along with them are more modern varieties derived from crosses with the northern flints, with Caribbean flints, and with corn-belt varieties from farther north. For the purpose of this study we have made a rough grouping of the material under observation as: (1) old southern dents, (2) derived southern dents. Our collections of these corns were reasonably complete and our survey is a comprehensive one, particularly in relation to the role played by these varieties in the development of the maize of the United States corn belt. The Caribbean flints, although undoubtedly involved, were peripheral to the area covered by our studies and have therefore been omitted from this survey. These tropical flints, because of their wide distribution in both hemispheres, deserve exhaustive analysis, but to be carried on effectively such a study would require adequate experimental fields in a subtropical environment.

The methods used in this study were essentially those applied to previous surveys of maize in the United States and Latin America. A few selections were

grown and observed over a period of years. In the winter of 1946-47 an intensive effort was made to get together as representative a collection as possible, including large field samples, to show the range of variation. The collection was grown in duplicate at Gray Summit, Missouri, and at Johnston, Iowa. For each culture, photographs were made of representative plants, of representative tassels, ears, and kernels. The variation of the tassel was observed and recorded in detail, and the chromosome knob number was determined from pachytene smears. Much of this information is presented below in tabular summaries.

HISTORY

Compared to the northern flints, the history and archaeology of the southern dents are in a very unsatisfactory state. There are several clear descriptions of the northern flints in the pre-colonial and colonial literature, and over a wide area in the eastern states they are the only archaeological type which has yet been discovered. The dents are a variable lot. We would need to have many more archaeological specimens if we were to do equally as good a job with them as with the northern flints, and as yet we have almost none. From those specimens which we have been able to examine, it is certain that dented varieties were grown in the Great Plains in pre-historic and proto-historic times. The story of corn in that area is apparently a very complicated one. Not until the archaeology of that region is better understood and not until we have seen many more collections which include maize remains will we be in a position to discuss the early history of dent corns in the region now occupied by the United States. For the states east of the Mississippi where we have descriptions of strongly dented varieties in early colonial times, we have as yet seen no archaeological material. As far south as Alabama and Georgia the archaeological record (away from the Mississippi Valley) is made up of wide-seeded flint or flour corns of the same general type as the "northern flints" of New England and Canada. This suggests that the dented varieties described in the Colonial records were relative newcomers and were in the process of pushing northward and eastward at the time of European contact.

Apparently the earliest description of a southern dent corn is in Beverly's history of Virginia written in 1705. He wrote that it is: "a larger grain and looks shriveled with a dent on the back of the grain as if it had never come to perfection; and this they call She corn." In the agricultural note books of Charles Read of New Jersey occurs the earliest reference we have been able to find to dent corn described as such. In an entry for 1756 he lists the weights of various kinds of corn, among others, "Egg-Harbor Dented" and "the long-grained, Lower County corn." (See Woodward, 1941).

At about this same period we have a fairly good description of a deeply dented white corn from Louisiana. Dumont, in his *Mémoires historiques sur la Louisiane*, published in 1753, has the following description (pp. 32–34):

> "On distingue deux sortes de mahi, dont l'un est propre à faire de la farine, & l'autre non: ce dernier a le grain tout rond; l'autre l'a un peu plus plat, & se distingue par une espéce de coup d'ongle ou de rainure qui regne sur toute la longeur des graines." [Two kinds of maize can be distinguished, one good to make meal, the other not. The latter has the kernel quite round, the other is a little more flat and is distinguished by a kind of claw point or groove prevailing along the whole length of the kernel.]

John Lorain, whose shrewd observations on maize and maize breeding were unsurpassed until long after his time, provides us with the first detailed description of gourdseed varieties. In a letter dated October 25, 1813, and published in the *Memoirs of the Philadelphia Society for Promoting Agriculture* (Vol. III, pp. 308–310) he described Gourdseed:

> "The cob of this is neither so long or thick as the large solid corns but the grains are very long, forming a compact, round and gradual taper to a point where they join the cob. It is vastly more productive than any other known original corn but ripens late and the grains are too soft and open for exportation, unless kiln dried. This variety, so far as my observation goes, is invariably white; for although I have frequently heard of a solid yellow gourdseed corn, yet on investigation, nothing more has appeared than a mixture of the hard yellow corns with the white gourd seed."

In his book on agriculture published posthumously in 1825 Lorain goes into greater detail. He describes the gourdseed varieties as having up to 32 and sometimes even 36 rows of kernels. The results to be obtained from mixing gourdseeds and northern flints were accurately described in considerable detail and the benefits of such a mixture were clearly set forth.

Lorain's writings clearly indicate that the purposeful (as well as accidental) mixing of gourdseeds and flints was already well under way in the early 1800's. From the agricultural press and such early scientific agencies as the U. S. Patent Office and the State Agricultural Reports, one can reconstruct quite accurately the history of the dent varieties of the United States corn belt. Some of the main evidence has already been reviewed in our survey of the northern flint corns and need not be repeated here. We can summarize the results, in so far as the United States corn belt is concerned, by saying that the northern flints and southern dents (originally two very different types of maize) were so repeatedly crossed and recrossed that the mixtures bred from them eventually dominated the entire region. Today the 8-rowed flints are grown, if at all, only in the extreme north, and the gourdseeds and shoepegs have completely disappeared from the actual corn belt. Their very names have been largely forgotten, and even in the southern states it is only a few conservative families who still grow them.

Cytology

A cytological peculiarity of maize is that at certain points on the chromosomes there may be definite knobs of more deeply staining material. The knob number is constant for any individual plant and in the corn of the United States may vary from 0 to about 14 (haploid number). It can therefore be used as one criterion in determining the relationships of various kinds of maize.

The number of chromosome knobs was determined for each of the varieties included in this study. Knob counts were, without exception, made from temporary smears of pachytene chromosomes stained either with aceto-carmine or propionic-carmine. Since the seed from which our cultures were grown was from open-pollinated stocks, they exhibited considerable morphological and cytological variability, as might be expected. For purely physical reasons, where several cultures are involved, it is impracticable to determine knob numbers of a large number of plants of each culture. The data on knob numbers reported herein were taken from two to four plants of each variety and show primarily the overall range of variability between varieties. Had we worked with larger numbers of plants we possibly would have encountered a greater degree of variation within some varieties than is reported.

As is often true, some difficulty was encountered in distinguishing between large chromomeres and small knobs. Our policy has been to count as knobs only those pycnotic enlargements that are strikingly larger than the average chromomere. This practice has been followed even when the enlargement was located at a known knob position. For this reason our counts should be taken as conservative. Since the organizer knob on chromosome No. 6 is present in all strains of maize, we have excluded it in our enumerations of knob number.

It will be noted that knob numbers in this material range from 4 to 12. When the varieties are separated into (1) old southern dents, and (2) derived southern dents, it is immediately apparent that the majority of the high knob varieties are to be found among the first group while those with lower numbers are mostly distributed among the derived southern dents (fig. 1). This association is to be

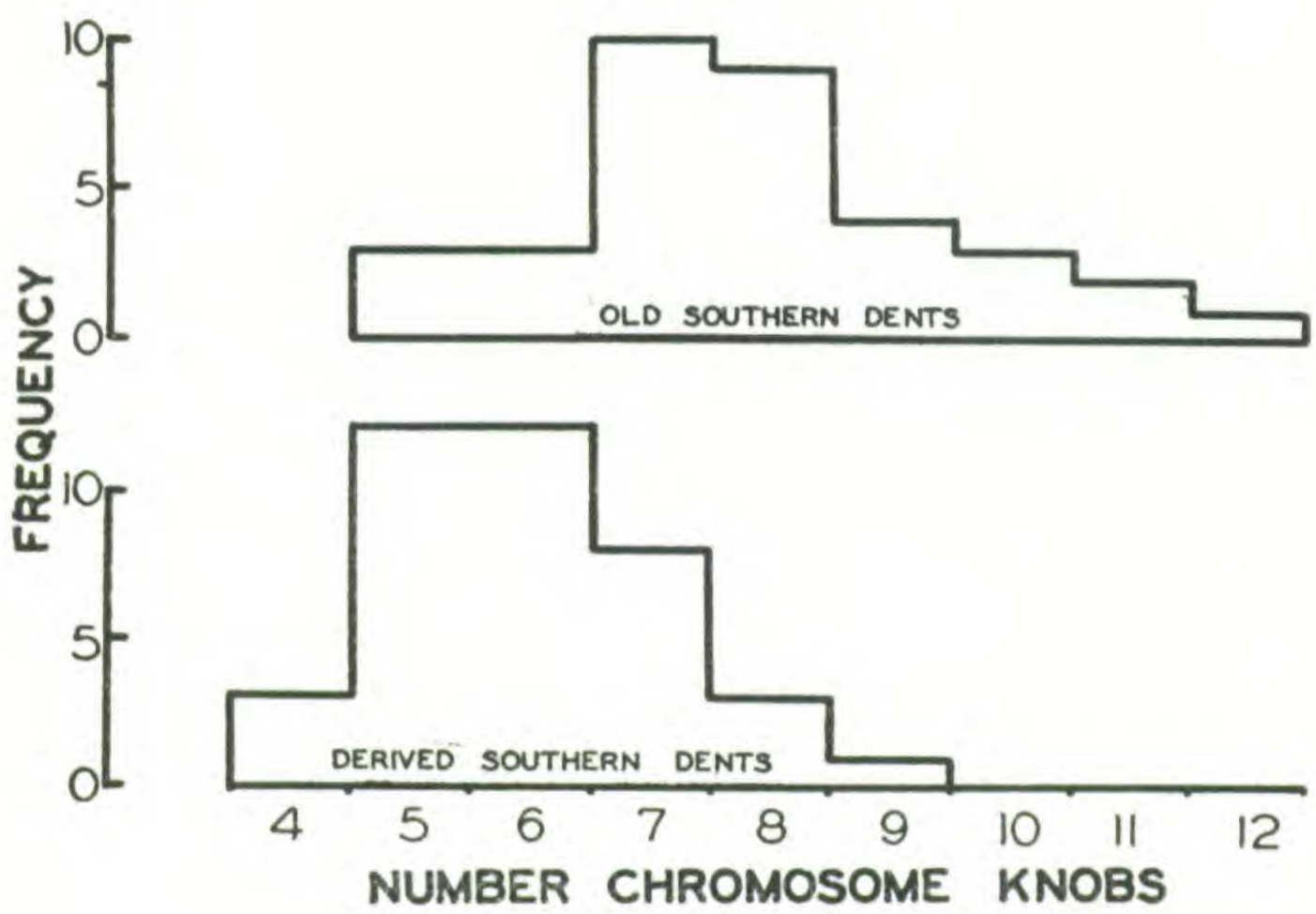

Fig. 1. Distribution of chromosome knobs in southern dent corns.

expected when we take into consideration the history of these two groups of corns. The old southern dents have evolved without drastic change from varieties of central Mexico which are known to possess relatively high numbers of chromosome knobs, while those types we have termed derived southern dents have largely arisen, either at first or second hand, out of crosses between old southern dents and northern varieties with lower knob numbers.

Morphology

The southern dents differ from the northern flints and from corn-belt dent varieties by a number of gross morphological characters, of which the following are more obvious. Plants of most southern varieties are unusually tall as compared to other United States corns. This is true whether we study them in the south or grow them farther to the north. The increased height is due to the presence of more nodes and not to an increase in internode length. In fact, most southern dents resemble Mexican dents in having extremely short internodes above the ear as compared to the long upper internodes of the northern flints (figs. 2–3). Ears are carried high on the culms and are enveloped in tight, thick husks which often extend well beyond the ends of the ears. Husks are usually composed solely of modified leaf sheaths, the blade portion of the husk being only slightly developed, if at all, and as a result one never finds the extensive "flag leaves" that are so common in northern flints. As a group the southern dents do not have tillers, although there are strains, particularly among the derived sorts, that occasionally produce a few. Prop-roots are well developed, and in certain of the more Mexican-like varieties they may be found even at the sixth and seventh nodes when they are grown in the north.

In contrast to the northern flints and most corn-belt maize, the tassels of the southern dents are many-branched and often highly condensed[1] (pls. 20–21). In many varieties the secondary branches are upright and comparatively short, resulting in a "whisk broom" appearance that is rarely found in the northern flints. In general, the numbers of tertiary branches in the tassels of southern dents are much greater than in the northern flints or corn-belt dents.

Most southern dents have a white endosperm although one or two varieties in our collection had yellow. According to the best historical evidence, the older southern dents were all white and the occurrence of yellow endosperm in the more modern strains is the result of outcrossing to yellow varieties. Although cob color is predominantly white, a few exceptional varieties with red cobs were represented in our cultures.

As mentioned above, we have rather arbitrarily divided our collection into (1) old southern dents, and (2) derived southern dents. In the second group we

[1] We are here referring to "condensation" in the technical sense, as defined by Anderson (1944); a condensation (or telescoping) of successive internodes on the tassel branches.

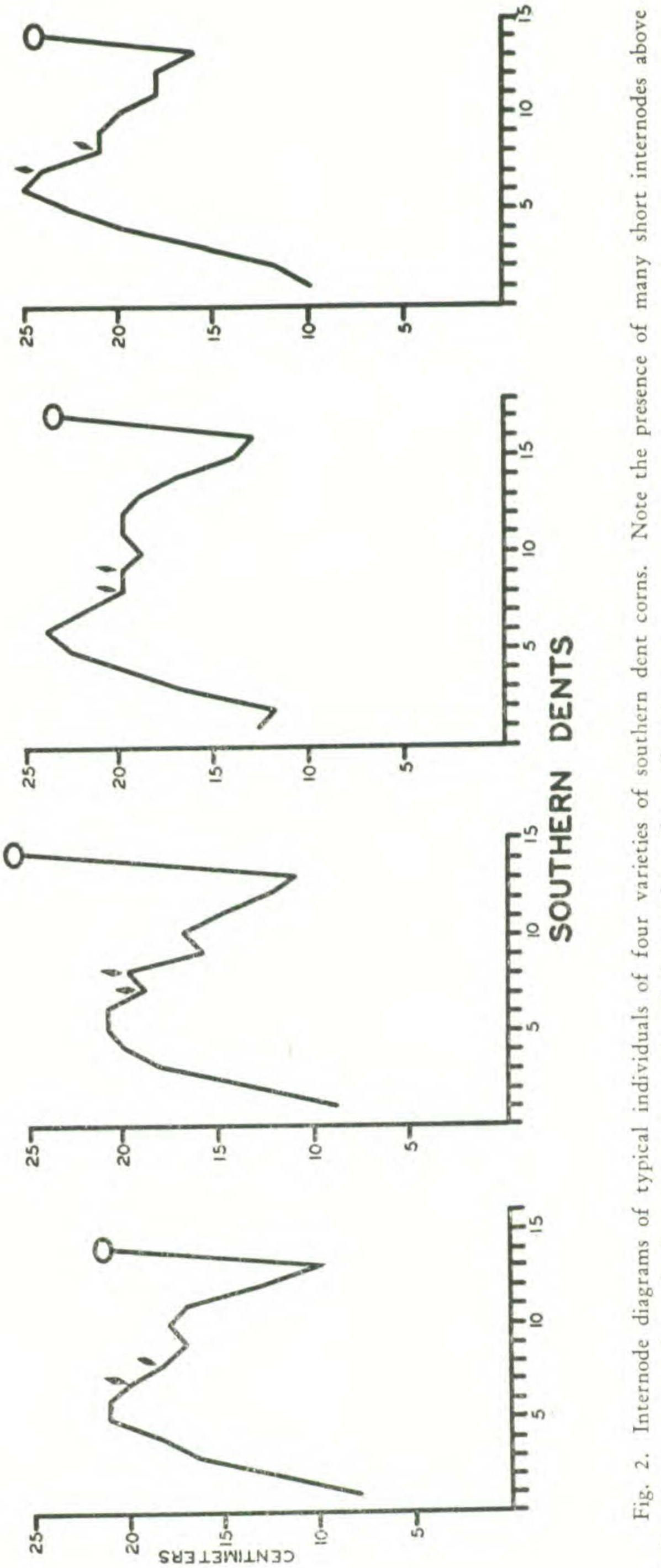

Fig. 2. Internode diagrams of typical individuals of four varieties of southern dent corns. Note the presence of many short internodes above the ears as contrasted to the long upper internodes of the northern flints (fig. 3).

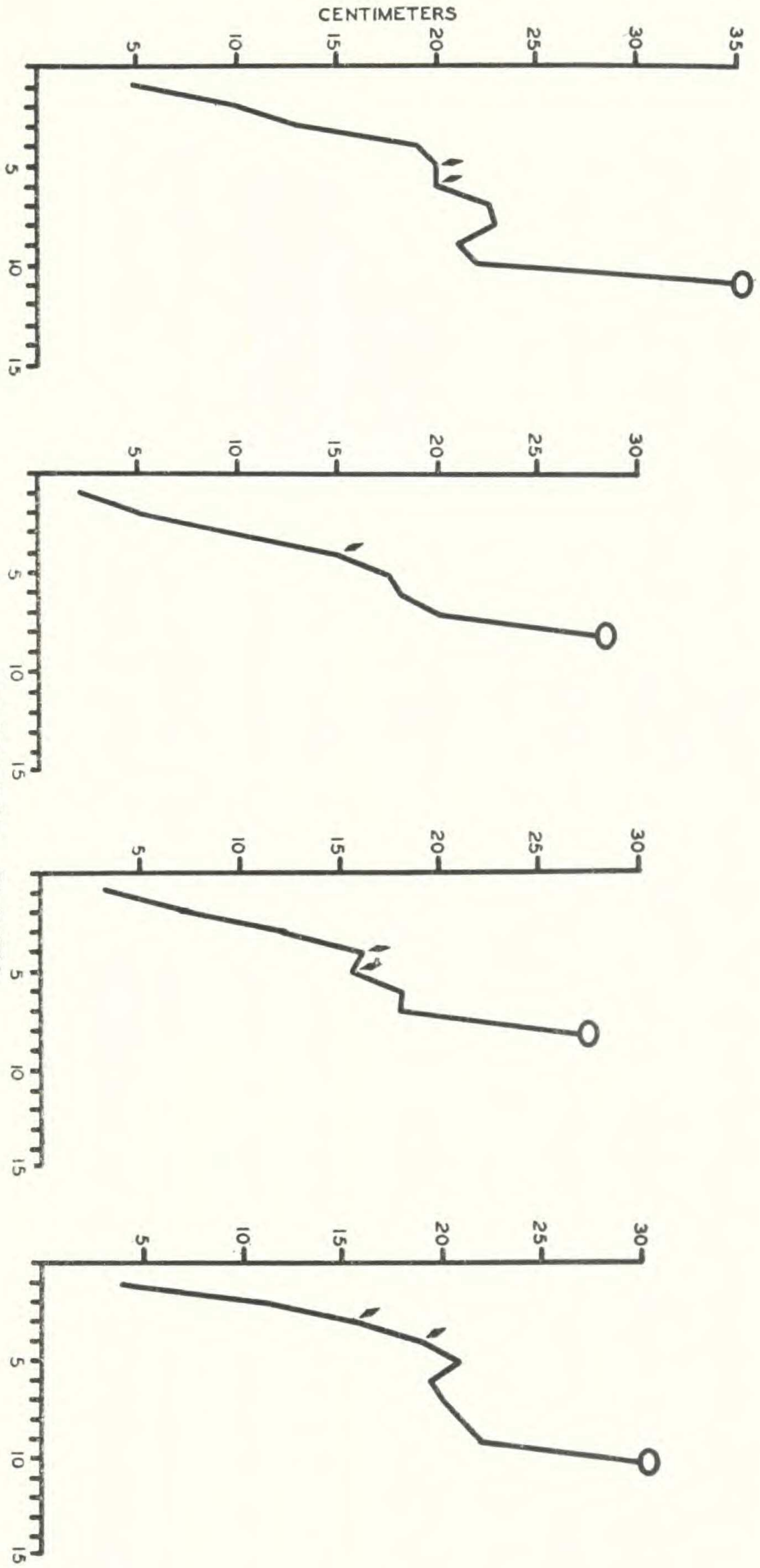

Fig. 3. Internode diagrams of typical individuals of four varieties of northern flint corns.

have placed those varieties whose morphology or whose known history indicates that they were derived by mixing southern dents with Creole flints, northern flints, or varieties from the corn belt.

Old Southern Dents.—

The old southern dents themselves do not form a homogeneous group. Three main types are represented, each one apparently derived from similar varieties which were and are grown in Mexico.

A. *Gourdseed and Shoepeg.*—These names are applied to rough white dents, which, on the whole, are much alike and may represent two extremes of the pointed-kerneled dent corns which are widely known in Mexico as "*pepitillo.*" Both of them are so strongly dented as to be collapsed at the pointed tip of the kernel. The gourdseed's kernel, though long and pointed, is also flattened with somewhat rounded sides, so that it looks not unlike the white seed of a cucurbit, hence its popular name. The shoepegs are the opposite extreme. The seed is very

TABLE I
VARIETIES OF OLD SOUTHERN DENTS

Variety	Source	Cob Color	Pericarp	Aleurone	Endosperm	Kernel width (mm.)	K. width/ K. th. (mm.)	Denting*	Mean row number	Number chromosome knobs
Gourdseed	Texas	White	Colorless	Colorless	White	7.1	2.3	5	18.1	6,7,8
Hickory King	Va.	White	Colorless	Colorless	White	13.0	3.4	3	8.4	7
Hickory King	Ga.	White	Colorless	Colorless	White	12.3	3.4	2	8.0	6,11,12
Hickory King	Tenn.	White	Colorless	Colorless	White	12.5	3.5	3	8.0	5,7,8
Jellicorse	Va.	White	Colorless	Colorless	White	7.6	2.1	4	12.7	9
June Corn	La.	White	Colorless	Colorless	White	7.0	2.1	2	14.2	10,11
Mexican June	Tenn.	White	Colorless	Colorless	White	8.0	2.2	2	13.8	7,8
Mexican June	Tenn.	White	Colorless	Purple & colorless	White	7.7	2.2	2	14.6	9
Old White Dent (1)	Ark.	White	Colorless	Colorless	White	7.8	2.2	4	16.0	5
Old White Dent (2)	Ark.	White	Colorless	Colorless	White	8.2	2.5	3	15.5	5
Red Cob Chisholm	Texas	Red	Colorless	Colorless	White	9.0	1.8	3	14.3	10
Shoepeg	La.	Red	Colorless	Colorless	White	5.0	1.5	5	18.3	7,8
Shoepeg	La.	Red	Colorless	Colorless	White	6.2	1.7	5	20.0	6
Shoepeg	La.	Red	Colorless	Colorless	White	5.2	1.6	5	18.6	7
Tenn. Red Cob	Tenn.	Red	Colorless	Colorless	White	7.1	2.2	4	14.4	7,8
Tuxpan	La.	White	Colorless	Colorless	White	7.2	2.1	3	14.8	7,8,9
Tuxpan	Va.	White	Colorless	Colorless	White	7.0	2.2	3	14.2	8
White Dent	Ark.	Red	Colorless	Colorless	White	7.0	2.6	4	16.0	7
Yellow Shoepeg	La.	Red	Colorless	Colorless	Yellow	5.2	1.6	5	19.6	7,8,9,10
Yellow Tuxpan	La.	White	Colorless	Colorless	Yellow	8.0	2.1	2	14.0	8

* 0—No soft starch at apex of kernel.
1—Soft starch but no denting.
2—Soft starch and a small dent.
3—Soft starch and a deep dent but no wrinkling of pericarp.
4—Soft starch and wrinkling pericarp.
5—Soft starch and the apex of kernel collapsed.

long and narrow, the sides being almost parallel, and it is pointed at the tip, the point itself usually being turned toward the apex of the ear by the tight husks to form a distinct hook at the top of the kernel (pl. 21).

The gourdseeds and shoepegs may well have been selected from the same fundamental stock and probably represent extremes of the same gourdseed type. The names, however, have been used to distinguish them for many years. The measurements (Table I) and accompanying photographs (pls. 20, 21) are drawn from samples collected in Louisiana and Texas.

TABLE II
VARIETIES OF DERIVED SOUTHERN DENTS

Variety	Source	Cob Color	Pericarp	Aleurone	Endosperm	Kernel width (mm.)	K. width/ K. th. (mm.)	Denting*	Mean row number	Number chromosome knobs
Cambren	Ky.	White	Colorless	Colorless	White	8.0	2.1	3	10.0	6
Caraway's Prolific	La.	Red	Colorless	Colorless	Yellow	6.5	1.9	3	14.3	6,7
Cherokee	Ga.	White	Colorless	Colorless	White	6.7	2.1	3	15.3	5
Clark's Yel. Dent	Texas	Red	Colorless	Colorless	Yellow	8.4	2.5	4	14.4	5,6
Columbia Beauty	Tenn.	Red	Colorless	Colorless	White	6.9	2.2	4	16.8	6
Garretts 1	Ky.	Red	Colorless	Colorless	White	7.0	2.1	3	15.1	5,6
Garretts 2	Ky.	Red	Colorless	Colorless	White	7.2	2.2	3	15.3	7
Giant Yel. Dent	Texas	Red	Colorless	Colorless	Yellow	9.7	2.7	4	12.5	5
Huffman	Tenn.	White	Colorless	Colorless	White	7.5	2.0	3	16.0	5
Jarvis Gol. Prolific	Tenn.	White	Colorless	Colorless	Yellow	7.2	2.0	2	14.0	5
Jarvis Gol. Prolific	Miss.	White	Colorless	Colorless	Yellow	7.3	2.1	2	12.7	4
Johnston Co. White	Mo.	White	Colorless	Colorless	White	7.7	2.0	5	18.0	7
Latham's Double	Va.	Red	Colorless	Colorless	White	5.8	1.8	3	14.8	6
Mammoth Ensilage	Va.	White	Colorless	Colorless	White	8.0	2.3	4	14.5	5
Mosby's Prolific	Va.	White	Colorless	Colorless	White	6.8	2.1	4	16.1	7,8
Mosby's Prolific	Miss.	White	Colorless	Colorless	White	7.0	2.2	2	13.5	5
Mosby's Prolific	La.	White	Colorless	Colorless	White	6.7	2.0	3	12.2	7
Mosby's Prolific	Tenn.	White	Colorless	Colorless	White	6.9	2.1	3	13.7	6
Neal's Paymaster	Ark.	White	Colorless	Colorless	White	6.8	2.1	4	15.6	6
Neal's Paymaster	Miss.	Red	Colorless	Colorless	White	7.4	2.2	4	14.7	6
Sherman	Tenn.	White	Colorless	Colorless	White	6.5	2.1	3	14.8	5
Southern Ill. 1	Ill.	White	Colorless	Colorless	White	9.0	2.6	3	13.6	5
Southern Ill. 2	Ill.	Red& White	Colorless	Colorless	White	7.0	1.5	3	15.3	6,7
Southern S'flake	Va.	White	Colorless	Colorless	White	6.6	2.2	3	17.0	5
Southern Yel. Dent	Miss.	Red	Light yel.	Colorless	Yellow	7.1	2.1	3	16.0	4,5
Strawberry	Texas	Red& White	Var'gated	Colorless	Yellow	7.9	2.4	3	14.6	8,9
Va. Horsetooth	Va.	White	Colorless	Colorless	White	6.2	1.8	3	17.7	4,6,7
Whatley's Prolific	Va.	Red	Colorless	Colorless	White	7.4	1.7	3	15.1	7,8
Yellow Dent	La.	White	Colorless	Colorless	Yellow	8.1	2.5	3	11.1	6
10 Row Dent	Ark.	Red	Colorless	Colorless	White	7.8	2.2	3	13.2	5

* 0. No soft starch at apex of kernel.
1. Soft starch but no denting.
2. Soft starch and a small dent.
3. Soft starch and a deep dent but no wrinkling of pericarp.
4. Soft starch and wrinkling pericarp.
5. Soft starch and the apex of kernel collapsed.

B. *Mexican June Complex.*—This category includes a rather closely related group of corns, the better known of which bear such varietial names as Mexican June, June Corn, Jellicorse, and Tuxpan. Although considerable variation exists within and between varieties, the group may be characterized and distinguished from the gourdseeds and shoepegs by having fewer rows of kernels and a lower degree of denting. Row numbers are usually 12 to 14. Ear shape varies from almost cylindrical to a very strong taper. The base of the ear is frequently compressed, and there is a tendency for slight irregularity in rowing at the base. The kernels are usually longer than wide and are slightly pointed. There is always a distinct cap of soft starch at the tip of the seed, bearing a small to medium dimple dent. Cobs are usually white.

This group of varieties is as Mexican-like as any in our collection. In ear type they are very similar to collections from central Mexico that have been classified by Anderson (1946) as intermediates between Mexican Pyramidal and Mexican Narrow Ear. These varieties likewise show a strong affinity in plant type to certain central Mexican corns. Tassel branches are several and are usually rather short. Leaves are broad and the sheaths often carry strong plant color. The leaf sheaths tightly envelop the culms as contrasted to the loose "puffy" sheaths of the gourdseeds and shoepegs. In the variety Tuxpan, the sheaths above the ears exhibit considerable pubescence both on the backs as well as at the edges, a common characteristic of most varieties of Central Mexico.

C. *Hickory King.*—Hickory King, one of the older varieties of southern dents, possesses a group of ear characteristics that are so distinctive as to make it necessary to place it in a separate category among southern corns. Ears are narrow and cylindrical with 8 to 10 rows of seeds that are often as wide as long. Seeds are strongly flattened on top, and there is a very strong tendency for row pairing. A distinct cap of soft starch with a rather shallow dent and some wrinkling is characteristic of the variety. Plant type in Hickory King is not particularly distinctive. It is similar to many other old southern dents in that the plants are tall, have few tillers, and increasingly short internodes above the ear.

The relationship between Hickory King and certain Mexican corns seems quite clear. There is little doubt that the variety has arisen from a similar group of corns in Mexico that are known as "*tabloncillo.*" They form the commonest varieties of field corn over large areas in western Mexico and belong to the general race of corn termed Mexican Narrow Ear by Anderson (1946).

Derived Southern Dents.—

These corns apparently originated out of mixtures of gourdseeds, shoepegs, semi-hard Mexican June types, tropical flints and cylindrical dents from the corn belt. In ear type some show considerable gourdseed tendency, while others (including many of the "prolifics") appear to be rather closely related to the Mexican June complex. Jarvis Golden Prolific and similar varieties have many

characters in common with Creole or Caribbean flints and may carry rather large amounts of germ-plasm from this or some closely related source. Also among the varieties that we have included with the derived southern dents are those strains which are very similar to corn-belt dents. Perhaps they arose in the southern periphery of the corn belt in the same manner as did most corn-belt corn (i. e. through the union of northern flints and old southern dents) or perhaps they are the result of mixing old or derived southern dents with corn-belt dents.

Importance of the Old Southern Dents for the United States Corn Belt

The old southern dents should be of more than passing interest to corn breeders in that middle-western area centering in Iowa which is known as the United States Corn Belt. In the last few years there has been considerable interest among some United States corn-breeders in the possibility of obtaining superior germ-plasm from maize varieties in Central America and Mexico. Since the old southern dents are so similar to several Mexican types, many of the desired genes might be obtained with far less trouble from certain southern dents than from the Mexican varieties from which they are derived. The fact that they have already been moved part way towards the North should simplify the task of incorporating any of their desired characteristics into corn-belt inbreds. Our preliminary results indicate that the maturity of most southern dents will permit their being used in crosses in the Midwest without resorting to the use of day-length control. Since the general growth habit of southern United States varieties is already fairly similar to northern ones, there probably would be fewer undesirable combinations to be discarded in breeding from southern material.

One specific quality which might prove useful in future breeding programs is the soft texture of the southern dents. Preliminary results indicate that crosses with these southern varieties will produce softer-textured dents than have been available in the corn belt. If changes in the methods of harvesting corn-belt maize should make it desirable to breed for varieties with two or more ears, certain southern varieties of prolific habit could supply the genes necessary for the expression of this character. There are already indications in our data that much of the heterosis in United States corn-belt varieties comes from combining northern flints and the southern dents. It is improbable that the maximum number of genes making for hybrid vigor has already been extracted from these two stocks. It might be possible to increase the potential hybrid vigor of our corn-belt hybrids by bringing deliberately into our inbreds additional sets of differing genes from the northern flints and the southern dents.

One of the most promising uses of the southern dents may be to illuminate the genetics of multiple-factor characters in maize. From the viewpoint either of the practical breeder or of general evolutionary theory, the genes which control multiple-factor differences are of far greater importance than the single genes

ordinarily employed in genetic experiments. Yet in spite of their over-all importance we know little about them, and experiments designed to tell us more have been so discouragingly difficult that little real advance has been made since East's preliminary investigations. A study of the northern flints and southern dents is a promising avenue of approach to this problem. It has been shown from data on species crosses, as well as from theoretical deductions, that in crossing well-differentiated races, all the multiple-factor characters are partly linked in the second generation and that the total effect of this linkage can be removed only by many generations of controlled breeding, if at all. We may therefore expect the multiple-factor characters which differentiate the northern flints from the southern dents still to be somewhat linked in the maize of the United States corn belt. The experience of practical breeders indicates that this expectation is certainly realized. High-row numbers, tapering ears, soft texture, and pointed kernels are characters which went together into corn-belt corn from the southern dents. It is common experience among corn-breeders that this complex of characters still tends to stay together after a century of breeding and selection.

A careful study of the southern dents, particularly in their contrasts to the northern flints, should help us by suggesting character combinations which may still be more or less associated in modern corn-belt varieties. Furthermore, by using corn belt inbreds, northern flints, and southern dents, in controlled experiments, it should eventually be possible to learn what kinds of genes differentiate these types of maize, roughly how many of them there are, and on what chromosomes they are distributed.

SUMMARY

1. The dent corns of the South are of importance because some of them were extensively used during the nineteenth century in developing the more highly derived varieties of the United States corn belt.

2. After several years of preliminary study, a comprehensive collection was assembled and grown in duplicate in Iowa and Missouri. Standardized photographs were made of plants, tassels, and ears. Pachytene smears of the pollen mother cells were studied to determine the number of chromosome knobs. A portion of this information is summarized in tabular form.

3. For the purposes of this discussion the southern dents are roughly grouped into: (1) the old southern dents, and (2) derived southern dents. The former were almost certainly derived from certain Mexican varieties. The derived dents originated from crosses between the old southern dents and northern and tropical flints as well as from crosses with corn-belt dents.

4. No archaeological records of old southern dents or of similar varieties have yet been obtained from the eastern states. Our earliest records are accounts from Louisiana and Virginia in the eighteenth century. The historical evidence for their having been used in the creation of the varieties of the present United

States corn belt is well documented and reasonably complete.

5. The chromosome knob numbers of the old southern dents in our cultures ranged from 4 to 12. As might be expected, numbers were higher among the old southern dents than among the derived dents.

6. The morphology of the southern dent corns is briefly summarized. The more important varieties such as Gourdseed, Shoepeg, and Hickory King, are discussed in more detail.

7. The probable usefulness of the southern dents to practical plant breeding and to theoretical genetics is discussed. It is suggested that they might be more useful sources for certain desirable characters, such as soft texture, than some of the Mexican and Central American varieties which have been considered. To theoretical genetics, they offer a combination of multiple-factor characters which is greatly different from that found in modern United States corn and still more radically different from that of the northern flints. By intercrossing these three types of corn (and with the use of marker genes and cytological analyses) it should be possible to estimate the numbers of multiple-factor genes involved and their distribution in the germ-plasm.

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Explanation of Plates

PLATES 18–23

Representative specimens of "old" and "derived" varieties of southern dent corns; 1—plant; 2—mature tassel; 3—typical ears; 4—seeds. Each division on the background of plant and tassel photographs represents 50 (cm.). Each division on the scale opposite the ears represents 1 (cm.).

Plate 18. Caraway's' Prolific.

Plate 19. Tuxpan.

Plate 20. Gourdseed.

Plate 21. Shoepeg.

Plate 22. Mexican June.

Plate 23. Hickory King.